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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/069,208	02/22/2002	Ken Kobayashi	07553.0028	7671

7590 02/08/2005

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EXAMINER

ALANKO, ANITA KAREN

ART UNIT PAPER NUMBER

1765

DATE MAILED: 02/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/069,208

Applicant(s)

KOBAYASHI ET AL.

Examiner

Anita K Alanko

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 November 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 10-29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 10-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☒ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

Specification

The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: the specification lacks explicit antecedent basis for new claims 28-29.

Claim Rejections - 35 USC § 112

Claims 28-29 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The newly added phrase “without restarting the etching process” is new matter.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 10-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Robb (US 4,529,860) in view of admitted prior art.

Robb discloses a method of etching an organic film (polyimide) on a workpiece (silicon substrate) (Example V, which incorporates Example I, col.6, lines 27-61 and col.4, lines 7+,

respectively), the organic film having an etching mask (hard mask layer of silicon nitride or silicon oxide), the method comprising:

placing the workpiece in a hermetically sealed process chamber 38;

introducing processing gas comprising a gas comprising nitrogen atoms and a gas comprising hydrogen atoms into the process chamber (“mixed hydrogen-nitrogen plasma” or Example V); and

etching the organic film (the anisotropic etch of Example V).

Robb does not explicitly recite that the etch is stopped before the etching goes through the organic film. However, Robb does teach that the etch can be conducted to a “predetermined amount” (col.2, lines 52-54). Admitted prior art teaches that it is useful to stop the etch before the etch goes through the film (page 1, lines 25-28) It would have been obvious to one with ordinary skill in the art to stop the etch before the etching goes through the film in the method of Robb because Robb teaches to etch a predetermined amount and admitted prior art teaches it is useful to etch part-way through the layer.

Robb does not explicitly disclose that microtrench is prevented, however the figures show that during etching to form a ditch with a flat bottom surface, that micro trenches are substantially prevented since they are not shown (Fig.2-3). Further, since the same method steps are disclosed by Robb as in the instant invention, the same results of forming a flat bottom surface while preventing a micro trench are expected.

Further, as to claim 10, Robb discloses to etch at 150 mTorr (20 Pa, Example V), and also teaches that a range of up to 500mTorr (66.5 Pa, col.1, lines 26-28) is known. Robb also teaches that high pressure etching of polyimide is also known (col.1, lines 21-22). The

relationship between pressure and etch rate is shown in Figure 5. Robb therefore teaches that the pressure is a result effective variable. It would have been obvious to one with ordinary skill in the art to etch at 500 mTorr or higher in the modified method of Robb because the pressure appears to reflect a result-effective variable which can be optimized. See MPEP 2144.05 IIB.

As to claims 11, 13-15, Robb discloses that the etch gas comprises nitrogen, hydrogen and argon (Example V and VI). It would have been obvious to one with ordinary skill in the art to add argon in the modified method of Robb because it is a conventional diluent for etch compositions as taught by Robb.

As to claim 12, it would have been obvious to one with ordinary skill in the art to etch at 500-800 mTorr in the modified method of Robb because the pressure appears to reflect a result-effective variable which can be optimized. See MPEP 2144.05 IIB

As to claims 16-27, admitted prior art (page 1, lines 25+) teaches that the damascene structure is a conventional structure. Wiring between levels conventionally includes forming contacts. It would have been obvious to apply the method of Robb to a damascene structure or a contact in the organic film because it is a conventional structure in microelectronics. Further, it would have been obvious to one with ordinary skill in the art to form the bottom surface of the ditch after stopping the etching and not restarting the etching, as this necessarily flows in the modified method of Robb.

Response to Amendment

The rejection of claims 10-27 under 35 U.S.C. 112, second paragraph is withdrawn in view of the amendment deleting the term "smooth". The specification is objected to as failing to

provide antecedent basis for new claims 28-29, and claims 28-29 are rejected under 35 USC 112, 1st paragraph for new matter. Claims 10-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Robb (US 4,529,860) in view of admitted prior art.

Response to Arguments

Applicant's arguments filed on 11/18/04 have been fully considered but they are not persuasive.

Applicant argues that Robb teaches that pressures above 53 Pa produces significant mask undercutting and that therefore the pressure should be maintained below 53 Pa. However, this is for the hydrogen and oxygen plasmas. The results are expected to be at least a little different in a hydrogen and nitrogen plasma, and one with ordinary skill in the art would recognize that. It is also well known that pressure effects etch rate, for example as shown in the graphs of Robb, so this is but one motivation to vary the pressure in the hydrogen and nitrogen plasma for best results.

Applicant argues that the pressure is not a result effective variable. Examiner disagrees since the graphs show that it effects the etch rates. The claimed ranges are not significantly different from Robb, and one with skill in the art would recognize to vary them as cited to optimize for best results.

Applicant argues that there is insufficient reasons for etching part-way through the layer. However, this is shown by admitted prior art. It is also well known to those with skill in the art. Why else would Robb explicitly disclose in column 2 a "predetermined amount"- if Robb meant to always etch completely through the layer, then Robb would have disclosed that. It is known

to one with skill in the art to etch part-way through layers, etching part-way through a layer is etching a predetermined amount.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Applicant's argument about a reasonable expectation of success is not persuasive. The method steps are not so complex. They merely comprise etching. Complex may include multiple etching steps with multiple etchants, doping, heating, lithography, or coating multiple layers of different compositions. None of those steps are present here, so it is unclear what is complex.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after

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the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anita K Alanko whose telephone number is 571-272-1458. The examiner can normally be reached on Mon-Fri until 2:30 pm (Wed until 11:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Anita K. Alanko

Anita K Alanko
Primary Examiner
Art Unit 1765